

REMARKS

Claims 1-7 are pending in this application. Claim 1 has been amended. No new matter has been introduced.

Claims 1-7 are rejected under 35 U.S.C. §103(a) as being unpatentable over Ward (U.S. Patent No. 5,350,501) (“Ward”). This rejection is respectfully traversed.

The subject matter of claims 1-7 would not have been obvious over Ward. The cited prior art reference does not disclose or suggest all limitations of amended independent claim 1. Ward is silent about “contacting the feedstock with the catalyst in the presence of hydrogen at elevated temperature and pressure of 260-430° C and 5-20MPa, to obtain a middle distillate with a content of aromatic compounds lower than the same fraction contained in the feedstock content.” Ward teaches a process for hydrocracking a hydrocarbon feedstock with a catalyst comprising beta zeolite and 15-50% by weight of a Y zeolite for producing gasoline or middle distillate products, especially light gasoline and turbine fuel (col. 3, ll. 24-34; see also ¶[0043] of the present application). Ward is silent, however, about low content aromatic compounds, or about “a middle distillate with a content of aromatic compounds lower than the same fraction contained in the feedstock content,” or about using a specific catalyst to obtain such low aromatic content middle distillate.

Ward also fails to disclose or suggest that “the beta zeolite ha[s] a silica-alumina ratio of at least about 250,” as claim 1 recites. Ward teaches that the beta zeolite “is prepared, in general, as an aluminosilicate zeolite having a silica-to-alumina molar ratio . . . of at least 10 up to about 100, but preferably no more than about 40, and most preferably in the range of 20 to 30.” (Col. 4, ll. 3-7). For at least these reasons, the Office Action fails to establish a prima facie case of obviousness, and withdrawal of the rejection of claims 1-7 is respectfully requested.

Applicants also submit the following comments regarding the patentability of claims 1-7 in view of Ward.

The objective of the claimed invention is a process for hydrocracking a hydrocarbon feedstock to low aromatic content middle distillates. The middle distillates produced are also advantageously of low pour points (see p. 7, ll. 18-22). This objective is achieved by the process of claim 1. In the inventive process, middle distillates are produced that have an unexpected lower aromatic content than would be obtained if a catalyst comprising a calculated average of the two components zeolite-Y and beta zeolite was used (see, e.g., p. 8, ll. 5-8; l. 14-17; and p. 11, ll. 25-29).

This unexpected effect is explained as follows:

It is known in the art that Y-zeolite is suitable for producing middle distillates with low aromaticity, whereas zeolite beta is not commonly known for lowering the aromaticity during production of middle distillates. The aromaticity in a middle distillate product prepared using a mixture of these two catalysts would be expected to have a value approximately equal to the calculated average of the aromaticity obtained from each of these two catalysts. A linear effect on aromaticity was expected. However the inventors unexpectedly observed an aromaticity that was much lower than the calculated average. The aromaticity of middle distillates obtained using the combination of Y-zeolite and beta zeolite was found to be non-linear and the total effect on lowering of aromaticity was found to be greater than the effect expected from a combination of the individual components. A synergistic effect was thus observed (see table 3 showing the results of the testing of all the catalysts prepared).


The objective of Ward is to prepare both gasoline and middle distillates using the disclosed catalyst. The process of Ward is not designed to maximize middle distillate yields (see col. 3, ll. 33-39). Ward is also not concerned with producing middle distillates with low aromatic content and there is no specific disclosure on this topic. Additionally, Ward is not concerned with obtaining middle distillates with low pour points. Ward mentions that the disclosed catalyst includes zeolite beta having silica-to-alumina molar ratios as high as 500:1 or more. However, the most preferable disclosed range is a silica-to-alumina molar ratio of 20 to 30 (see col.4, ll. 3-9). The examples of Ward also use a catalyst with a silica-to-alumina molar ratio of the low value of 26 lying within the preferred range.

The process of Ward has a different objective from the objective of the process of the claimed invention. Ward also provides a different catalyst from the one used in the claimed process since the silica-to-alumina molar ratios of the two catalysts are very different. Ward teaches the application of catalysts with low silica-to-alumina molar ratios, whereas the inventive process requires values of at least about 250. Thus, Ward does not provide any incentive to solve the problem of how to obtain middle distillates with reduced aromatic content using the disclosed catalyst. There is no mention of a synergistic effect on aromaticity obtainable with a mixture of the two catalysts.

Allowance of all pending claims is solicited.

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